
PHYSICAL ELEMENTS OF THE ENVIRONMENT

AIR

Abstract: Three airsheds cover the Arapaho and Roosevelt National Forests and Pawnee National Grassland: Front Range, Medicine Bow and Granby (see Figure 3.1). Within each of the airsheds five Air Quality Related Values (AQRVs) have been identified as having the potential to be impacted by human-caused air pollution. The five AQRVs are soil, water quality, flora, fauna and visibility.

The airsheds with the greatest potential for impacts to the AQRVs are the Front Range and Medicine Bow airsheds. The Granby airshed has low to moderate potential for impacts.

All *Forest Plan* alternatives have the potential to impact the AQRVs to some extent. In general, Alternatives A, C, E and I have the greatest potential, B has less, and H has the least.

Implementation of the Air Resource Management and Monitoring Plan, existing laws, regulations, and *Forest Plan* standards and guidelines can all contribute to minimizing future impacts to the AQRVs from any of the alternatives.

INTRODUCTION

The Front Range airshed includes the majority of the Arapaho and Roosevelt National Forests and all of the Pawnee National Grassland. The remainder of the ARNF is about evenly split between the Medicine Bow and Granby airsheds. All three airsheds have existing air quality impacts and the potential for further impacts from air pollutants such as sulfur dioxides, oxides of nitrogen and particulate matter. Although many of the documented impacts are associated with external sources (those outside Forest boundaries and jurisdiction), some Forest activities also have the potential to impact air quality. These include prescribed and wildland fires, oil and gas development, grazing, mining, developed recreation and use of travelways.

Air resources are linked to several of the revision topics explained in Chapter One of this *FEIS*.

Revision Topic: Maintenance of Biological Diversity. The variety of life and the processes through which organisms interrelate are influenced by the quality of the habitats they inhabit. Air quality can have direct and indirect effects on ecosystems, while ecosystem processes such as fire can radically change air quality at local and regional levels.

Revision Topic: National Forest and Residential Intermix. Land uses more often associated with urban and suburban areas are intermingled in many areas of the ARNF and some portions of the Grassland. Vehicular use and home heating associated with intermix areas can have direct, indirect, and cumulative effects on air resources.

In addition, management of air resources is linked to stewardship of other resources of concern in the Revision Topics for Oil and Gas Leasing and Travel Management.

Two areas within the Forest boundary, including portions of the Boulder District and a small area of the Clear Creek District, are in nonattainment for particulate matter (PM-10) and ozone¹. There are no areas within the Grassland boundary that are in nonattainment at this time.

Based on the activities implemented and permitted by the Forest and activities outside the ARNF-PNG, the AQRVs most at risk in all three airsheds are visibility and water quality.

Through the implementation of local, state and federal regulations, *Forest Plan* standards and guidelines and the Air Resource Management and Monitoring Plan, the Forest will be able to protect the forest and grassland ecosystems from unacceptable air pollution impacts and, where appropriate, improve degraded conditions, while still providing for multiple uses.

LEGAL FRAMEWORK

There are many federal statutes that provide the legal and regulatory framework for the management and protection of air resources. Many laws also outline the responsibilities of federal land managers in protecting and improving air resources. The following four acts provide the majority of this direction:

- Clean Air Act of 1990, as amended
- Wilderness Act of 1964
- Forest Rangeland and Renewable Resource Planning Act of 1974
- National Forest Management Act of 1976

The Clean Air Act and its amendments (1977, 1990) provide the legal and regulatory framework for air resource management on all National Forest System (NFS) lands, but it does not prescribe their management. The Forest Service is responsible for determining which components of ecosystems will be protected or improved, and to what extent management occurs. This is based in part on management goals. Those components that have the greatest potential to be impacted by human-caused air pollution are referred to as Air Quality Related Values (AQRVs). At this

¹ See Legal Framework for definition. There is one Class I Wilderness Area (defined in the Legal Framework) on the Forest, the Rawah Wilderness. Rocky Mountain National Park is also a Class I area and is surrounded by National Forest System lands. The remainder of the Forest and Grassland areas are Class II.

time the following AQRVs have been identified for the Forests and Grassland: soil, flora, fauna, water quality and visibility.

The Clean Air Act also outlines different levels or classes of protection above an established baseline. The three classes established under the Prevention of Significant Deterioration (PSD) permitting process of the Clean Air Act are Class I, Class II and Class III areas. Class I areas include wilderness areas designated as of August 7, 1977 that are 5,000 acres or greater in size, and also include all National Parks over 6,000 acres. These areas have the most stringent degree of protection from current and future air quality degradation. Class II areas are wilderness areas designated as of August 7, 1977 that are smaller than 5,000 acres, those wilderness areas designated after August 7, 1977 and all other NFS lands. Class II areas are often as sensitive to air pollution impacts and as much "at risk" from air pollution impacts as Class I areas. There are no Class III areas defined in the country at this time.

The Wilderness Act of 1964 does not directly address air pollution effects on wildernesses, but it does provide direction to the Forest Service on what to protect in less wilderness areas. "The earth and its community of life" is to be "preserved in its natural condition" in each wilderness. Thus, each component of a wilderness, including air, has intrinsic value, as well as value for the way it interacts and functions with the other components of the ecosystem.

The Forest and Range Renewable Resource Planning Act, as amended by the National Forest Management Act of 1976, directs the Forest Service to "...recognize the fundamental need to protect and where appropriate, improve the quality of soil, water and air resources...."

Other federal acts that provide management direction include the Organic Administrative Act of 1976, the Multiple Use Sustained Yield Act of 1960, and the National Environmental Policy Act. These acts require the Forest Service to develop plans that provide for multiple use of National Forests and Grasslands in a manner that maximizes long-term net public benefit in an environmentally sound manner.

The National Forests in Colorado are also responsible for complying with the State Clean Air Act and State Implementation Plans (SIP). These documents outline how the state will comply with the National Ambient Air Quality Standards (NAAQS). NAAQS are legal limits of atmospheric pollution established by the Environmental Protection Agency (EPA) for the protection of the public's health and welfare from adverse effects from air pollution. The responsible regulatory agency is the Colorado Department of Health/Air Pollution Control Division.

In addition to determining allowable limits of air pollution, the EPA is also responsible for developing regulations to ensure reasonable progress toward meeting national visibility goals for Class I areas where determinations of impairment to visibility have been established.

The SIPs also outline how air quality will be managed to meet EPA's conformity regulations, if a specific area is in nonattainment. An area is in nonattainment if it exceeds any of the NAAQS standards. The conformity rules are in section 107(c) of the Clean Air Act which states that activities of all federal agencies must conform to the intent of the SIP by: 1) not causing or

contributing to any violations of NAAQS; 2) increasing the frequency of any existing violations; or 3) impeding a state's progress toward meeting its air quality goals.

Larimer, Boulder, Clear Creek and Jefferson Counties include portions of the ARNF, and have additional local regulations with which the Forest must comply.

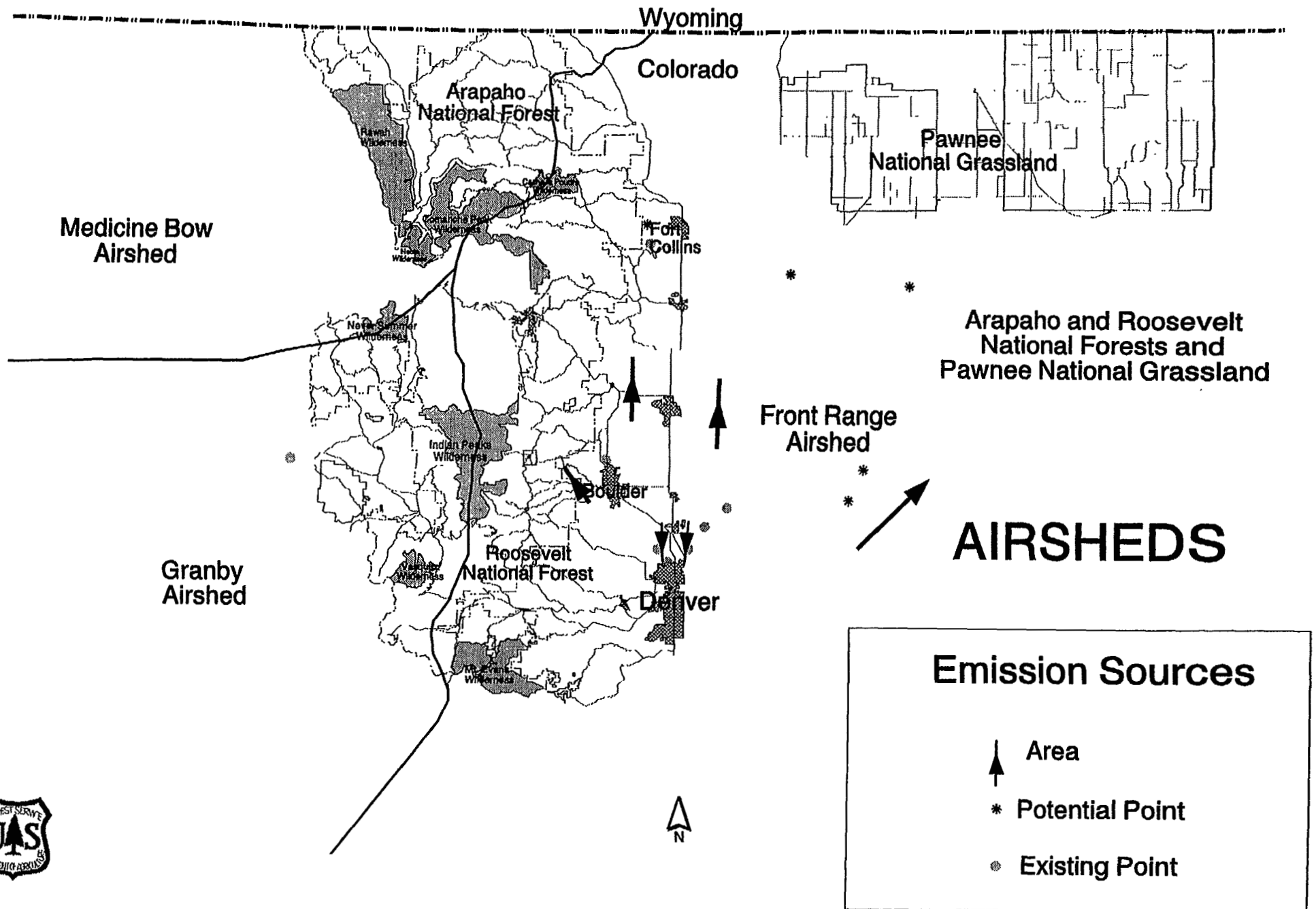
The Clean Air Act provides many opportunities, as well as requirements, for the federal land manager to protect Class I wilderness areas and other Class II wilderness and nonwilderness areas from air pollution. The ARNF-PNG is taking the proactive step of managing all wilderness areas at a level appropriate to the existing and potential impacts to the AQRVs. The Forest believes that this approach will help provide the management tools, data and information to meet all legal obligations to the ecosystem and local, state and federal regulations. This approach to management of wilderness areas applies only to how the Forest manages its own and other permitted activities in and around the wilderness areas. It does not represent a change in the legal classification of an area. The remainder of the Forest will continue to be managed as Class II, but this may be subject to change based on existing and potential impacts. The State has also taken a similar approach by considering impacts to Class II areas.

DESIRED FUTURE CONDITION

The desired future condition for air resources on the ARNF-PNG is to:

1. Maintain, and where appropriate decrease, the impacts to the AQRVs, to levels at or below the Levels of Acceptable Change and/or the National Ambient Air Quality Standards; and
2. Maintain, and where appropriate decrease, Forest emissions budgets to levels at or below those accepted by the state.

Figure 3.1



With the implementation of the Air Resource Management and Monitoring Plan and with adherence to state and federal laws and regulations, past as well as potential future impacts to the AQRVs can be addressed, while allowing for present and future multiple uses.

AFFECTED ENVIRONMENT

Most of the ARNF east of the Continental Divide and all of the PNG are within 100 miles of a major metropolitan area. This proximity increases the potential for impacts from air pollution, and is clearly evident in the locations of the nonattainment areas surrounding the Forests and Grassland. Four areas along the east side of the Forest are in nonattainment for carbon monoxide, PM-10, and ozone. These include the Denver metro area, the Ft. Collins urban growth area, Greeley urban growth area and parts of Longmont. The Steamboat Springs area airshed (defined by the Routt County Commissioners in 1991) is located west of the ARNF-PNG and is in nonattainment for PM-10. The Ft. Collins urban growth area lies west of the Pawnee National Grassland and is in nonattainment for carbon monoxide. The three airsheds covering the ARNF-PNG and their existing condition are discussed in more detail below.

The three airshed boundaries were based on topography, upper-level air flows, existing and potential emission sources and existing political/civil boundaries.

FRONT RANGE AIRSHED

This airshed contains most of the Roosevelt National Forest, a small portion of the Arapaho National Forest, and all of the Pawnee National Grassland. Elevations range from 5,000 to 14,000 feet. Average annual precipitation ranges from 12 to 25 inches on the Grassland to 16 to 40 inches or more at upper elevations on the National Forests. Most precipitation at the upper elevations falls in the form of snow. The prevailing winds are generally northwest to southeast, or southwest to northeast. There are four wilderness areas in the portion of this airshed over the National Forests: Comanche Peaks, Cache la Poudre, Mt. Evans, and the eastern half of the Indian Peaks. All are Class II wilderness areas. A small portion of the Class I Rocky Mountain National Park is included in this airshed. The Forest does not have jurisdiction over the National Park, but manages the NFS lands surrounding it.

Mobile and area sources from the Ft. Collins, Denver and Colorado Springs areas produce pollutants that may impact the Forests and Grassland. The pollutants of concern at this time include sulfur dioxide (SO₂), oxides of nitrogen (NO_x), particulates (PM-10, PM-2.5) and ozone (O₃).

Eleven large power plants currently operate in this airshed and four new plants are being proposed; none are on NFS lands. Two existing plants have applied for PSD (Prevention of Significant Deterioration) permits: Saint Vrain and Laramie Cement Plant. Other potential pollution sources are oil and gas development, ski area development and urbanization/ intermix.

Activities implemented or permitted by the Forest that may impact air quality include prescribed burning, use of unpaved travelways, grazing, oil and gas development, mining and developed recreation activities.

A priority ranking system developed by the Forest Service Region 2 Air Group places visibility and aquatic and terrestrial resources in the highest category of concern for monitoring in this airshed. The AQRVs with the highest priority for monitoring in the Indian Peaks Wilderness are visibility, water, flora and soil. The proximity of the Wilderness Area to the Denver metro area, its location on the eastern side of the Continental Divide and its proximity to nonattainment areas for carbon monoxide, PM-10 particulate matter and ozone, increase its potential for impacts from air pollution.

Existing data from the Niwot Ridge Biosphere Reserve and from Rocky Mountain National Park indicate that elevated levels of nitrogen occur in areas to the north and east of the wilderness. Lake chemistry data from the EPA's Western Lake Survey in 1985 showed that eleven of the twelve lakes sampled had acid neutralizing capacities (ANC) well below 200 microequivalents per liter ($\mu\text{eq/l}$), five below 70 and two of the five below 30. EPA considers a lake sensitive and its ability to buffer incoming acidity limited if the ANC is below 200 $\mu\text{eq/l}$.

Lake data from other areas such as Rocky Mountain National Park, Niwot Ridge Biosphere Reserve, Mt. Zirkel Wilderness and the Pike and San Isabel National Forests, also indicate lakes with ANCs below 200 $\mu\text{eq/l}$, indicating widespread potential for harm to lakes from air pollution.

MEDICINE BOW AIRSHED

This airshed covers a small portion of the Roosevelt National Forest at elevations from 6,000 to 14,000 feet. Average annual precipitation ranges from about 16 inches in the lower foothills to 45 inches or more at the upper elevations. Most precipitation in the upper elevations falls in the form of snow. The prevailing winds are generally northwest to southeast and west to east.

Three ARNF wilderness areas lie within the Medicine Bow airshed: Rawah, Neota and Never Summer. The Rawah Wilderness is a Class I area. Prevailing wind patterns may transport pollutants from mobile and area sources in Steamboat Springs and Craig, Colorado and in Encampment, Wyoming that impact the Forest. Pollutants of concern this time include sulfur dioxide (SO_2), oxides of nitrogen (NO_x) and particulates (PM-10, PM-2.5).

Other potential impacts include oil and gas development at upward locations, coal-fired power plants at Craig and Hayden, Colorado, ski area development, dust from mineral development, smoke from forest and agricultural burning, and oil shale processing.

Although there is little data for the Rawah Wilderness at this time, information exists for other areas in the airshed. Mt. Zirkel, the Glacier Lakes Ecosystem Experiment Site (GLEES) in Wyoming, and parts of Rocky Mountain National Park indicate possible impacts from sulfur dioxide and oxides of nitrogen.

A priority ranking system developed by the Forest Service Region 2 Air Group places visibility and terrestrial and aquatic resources in the highest category of concern for monitoring in this airshed. The Rawah Wilderness is a Class I area where laws and regulations give federal land managers more specific and stringent direction for protection and improvement; monitoring of this area consequently receives highest priority. In the summer of 1995, synoptic lake sampling began to help identify if any of the lakes are sensitive to acidification from air pollution. Depending on the outcome of the lake sampling data, lakes will be identified for long-term sampling and for more specific monitoring of aquatic and terrestrial flora and fauna. Visibility monitoring is planned for 1996 as well. More specific information on the monitoring can be found in the Air Resource Management and Monitoring Plan.

GRANBY AIRSHED

This airshed covers the majority of the Arapaho National Forest. Elevations range from 5,000 to 14,000 feet. Average annual precipitation averages about 24 inches in the lower foothills to 14 to 40 inches or more at the upper elevations. Most precipitation in the upper elevations falls in the form of snow. The prevailing winds are generally west to east.

This airshed includes half of the Indian Peaks Wilderness west of the Continental Divide, the Arapaho National Recreation Area, all of the Vasquez Wilderness and part of Rocky Mountain National Park. All NFS lands covered by this airshed are Class II areas. Rocky Mountain National Park is a Class I area, and is surrounded by NFS lands, but is outside the ARNF-PNG's jurisdiction.

Pollutants currently of concern are the same as in the Medicine Bow airshed: sulfur dioxide (SO₂), oxides of nitrogen (NO_x) and particulates (PM-10, PM-2.5). This airshed is also affected by regional haze from the southwest, local haze from the Henderson and Climax mines, and development related to the ski area at Winter Park. Although data are still sparse, the presence of regional haze raises concerns about the AQRV of visibility. Synoptic lake sampling also indicates that there are lakes in the Granby airshed sensitive to acid deposition.

There are no proposed sources at this time that will require a PSD (Prevention of Significant Deterioration) permit. Oil and gas development is a potential future impact.

A ranking system developed by the Forest Service Region 2 Air Group has identified visibility as the resource of highest concern and priority for monitoring in this airshed. Because the eastern portion of the Indian Peaks Wilderness is of priority in the Front Range airshed, protection of the western portion will be a priority for the Granby airshed. There may be an opportunity to use the west side of the Indian Peaks as a control area for monitoring on the east side, because prevailing weather patterns and source locations of pollutants may result in fewer impacts on the west side.

RESOURCE PROTECTION MEASURES

Federal land managers are responsible for protecting the Air Quality Related Values from impacts caused by human-induced air pollution in Class I areas. Air resource management occurs mainly through two activities: 1) involvement in the Prevention of Significant Deterioration permitting process; and 2) complying with the EPA's conformity regulations. The PSD permitting process gives federal land managers the opportunity to identify, monitor and request changes to potential impactors outside the National Forest. Compliance with the conformity regulations gives land managers the opportunity to identify potential impacts from Forest activities at the project level, including those that the ARNF-PNG authorizes others to conduct.

Table 3.1 is a general list by activity of the AQRVs that could be impacted and possible mitigation measures to reduce those impacts. Implementation of these measures in conjunction with current federal, state and local laws and regulations will help to keep projects from exceeding NAAQS and to help meet conformity regulations.

ENVIRONMENTAL CONSEQUENCES

Six Forest and Grassland activities could potentially impact air quality: prescribed fire and wildfires; use of travelways (paved or unpaved roads and trails); developed recreation (ski areas, campfires, summer homes, etc); mining; oil and gas leasing; domestic livestock grazing. Activities outside the boundaries and jurisdiction of the ARNF-PNG can potentially impact air quality as well. These include, but are not limited to:

- urbanization/intermix
- regional haze
- power plants and other fossil fuel utilizers
- mining
- agriculture (grazing, farming and stock yards)
- paved and unpaved travelways
- wildfires
- agricultural burning
- oil and gas development

Of the six activities managed by the Forest, fire, use of travelways, and motorized recreation impact the AQRVs most. The one activity within and outside the Forest boundary and Forest jurisdiction with the greatest potential to impact the AQRVs is urbanization/intermix.

Effects from mining, oil and gas exploration and development, dispersed recreation, firewood permits and grazing are considered short-term. On the Grassland, where the majority of the oil and gas exploration and development has occurred, small drilling rigs, which produce fewer emissions than large ones are typically used. Over the next five decades oil and gas exploration and mining are expected to stabilize or to decrease slightly as reserves dry up. Emissions from

dispersed recreation campfires are considered minimal. Although the ARNF is the closest forested area for providing firewood to major metropolitan areas along the Front Range, the demand for firewood is not expected to grow. The Front Range area has a high pollution period from November through February during which a variety of municipal and county wood-burning restrictions are often in effect. Some jurisdictions also have building codes that prohibit any new building from installing wood burning fireplaces or stoves that lack emission control devices. Large feed lots within the airsheds located off National Forest Lands are outside of Forest Service jurisdiction, and trends in their use are unclear at this time.

EFFECTS ON AIR FROM FIRE MANAGEMENT

Smoke and particulate matter (PM-10 and PM 2.5) produced by fires have the potential to impact visibility, water, flora and soil. The Forest would like to increase the amount of fuel management fire on the ARNF-PNG to treat about 4,000 acres a year (experienced budget level) or 7,000 acres a year (full budget level), with a maximum of 1,000 acres burned at any one time. The predicted level of 4,000 acres includes an average of 1,100 acres of wildfire annually except for Alternative H which is higher.

Computer modeling is used to predict emissions from fires and their effects on air quality. Runs on a model called Simple Approach Smoke Estimation Model (SASEM) for a variety of fuel types, burn types, burn durations, and fire intensities for fires from 1,000 to 6,000 acres, predicted that total particulate emissions produced would be less than the NAAQS standard of 150 micrograms per cubic meter. The emissions listed above do not include the toxins that are produced when structures in the intermix areas burn. By burning a maximum of 1,000 acres at one time and burning on only excellent to fair dispersion days, conformity regulations should also be met. However, if a site-specific computer model run such as SASEM showed that there was a sensitive receptor within the potentially affected area that might be impacted, NAAQS standards or conformity regulations could be exceeded.

Although prescribed burning may increase emissions in the short term, these burns could help to decrease the emissions from catastrophic wildfires by reducing fuel loading over the next five decades. Alternatives A, C and I have the least relative potential for impacts, while B, D, E and H have the greatest because impacts are proportional to the amount of burning predicted. The implementation of Alternatives B, D, E, and H in the Granby and Medicine Bow airsheds have the greatest potential for impacts. Because of the existing state and county regulations already controlling emissions, the Front Range airshed has a lower overall potential for impacts.

EFFECTS ON AIR FROM TRAVELWAYS

Most impacts from the use of ARNF-PNG travelways are associated with dust from unpaved surfaces and emissions from motorized vehicles. Most of these effects are localized and temporary. The exception is during the winter when there is the greatest potential for climatic inversions which can trap pollutants close to the surface at concentrations above the NAAQS standards. Impacts from vehicle emissions are mainly associated with activities outside the

ARNF-PNG jurisdiction. However, as the number and miles of travelways used by vehicles increases, the potential for those activities to impact the ARNF-PNG will increase.

Thus, Alternatives A, C and E have the greatest potential for impacts. Alternatives I and B have less potential for impacts, and Alternative H has the least. Under all alternatives, the Front Range airshed would have the greatest potential for impacts because of its proximity to population centers. The Medicine Bow airshed would have moderate potential and the Granby airshed the least potential for impacts.

EFFECTS ON AIR FROM DEVELOPED/MOTORIZED RECREATION

Most of the impacts from developed and motorized recreation opportunities come from ski areas, motorized recreation including snowmobiles, and campfires. Most of these effects are localized and temporary. During the fall and winter, however, climatic inversions can trap pollutants close to the surface at concentrations above the NAAQS standards. With activities such as snowmobiling and campfires, the current numbers are low enough that their effects are considered local and temporary. Most of the snowmobile activity occurs in areas where there are no nonattainment or maintenance areas or high pollution periods. Some of the activity does occur within 60 kilometers of a Class I wilderness area. Impacts from other motorized activities such as four wheel drives and OHVs are similar to those outlined under the travelways impacts.

In general, Alternatives H and A have the least potential for impacts, Alternatives B, C, and E have a moderate potential for impacts, and Alternative I has the greatest potential for impacts on the AQRVs. Under all alternatives, the Front Range airshed will have the greatest potential for impacts from motorized and developed recreation, due in part to its proximity to population centers and the number of existing nonattainment areas. The Granby airshed will have a moderate potential and the Medicine Bow airshed the least potential for impacts.

EFFECTS ON AIR FROM URBANIZATION/INTERMIX

Many of the impacts associated with urbanization within the ARNF-PNG are indirect. Although increases in population occur outside of Forest jurisdiction, a special use permit to pass through and/or utilize National Forest System land may be necessary to allow expansion of infrastructure to accommodate the increase in population. By providing a special use permit, the Forest gains limited responsibility and jurisdiction for user activities. The Forest must consider the effects of permitting activities that may bring in more motorized vehicles and a corresponding increase in amounts of carbon monoxide, oxides of nitrogen and particulate matter. The majority of the Forest's responsibilities are outlined in the special use permitting process.

Based on the amount of existing urbanization and the number of acres of intermixed lands, the Front Range airshed has the greatest potential for impacts, the Medicine Bow airshed moderate potential, and the Granby airshed the least potential. This relative ranking of potential for impacts is the same under all alternatives.

CUMULATIVE EFFECTS

As the population along the Front Range grows, and people's desire to find places to get away increases, so does the potential for development on private lands within the ARNF-PNG boundaries. Along with growth comes an increase in vehicle use, development of additional travelways, new developed recreation sites to accommodate users, and more demands for electricity or other fuels to supply homes and developed recreation sites. All of these changes increase the potential for greater emissions. The amount and type of toxic air pollutants that could occur when developed structures burn during fires also increases in potential as Front Range intermix areas become increasingly urban.

The contribution of activities outside the direct jurisdiction of the Forest can change quickly and is difficult to quantify. Current growth trends in Colorado are expected to continue over the next five decades. With that will come a continued increase in the amount of potential pollutants that may affect the three airsheds. Individual Forest activities will not exceed NAAQS standards, nor will Forest activities cumulatively exceed these standards.

Table 3.1 Resource Protection Measures^a

Activity	AQRV	Potential Mitigation Measure
Fire	Visibility Water Soil Flora Fauna	Decrease acres burned Alter type of material burned Do not burn during the high pollution period Use alternative forms of vegetation management Implement conformity regulations
Travelways	Visibility Water Soil Flora Fauna	Decrease number of unpaved travelways Decrease number of vehicle passes allowed Use water or some other dust abatement material Implement conformity regulations Use seasonal closures
Developed Recreation	Visibility Water Soil Flora Fauna	Decrease the number of units developed Use seasonal closures Implement conformity regulations
Mining	Flora Visibility Fauna Water Soil	Decrease the number of acres opened at one time Implement seasonal operation Implement travelway mitigation listed above Implement conformity regulations Use the PSD process

Activity	AQRV	Potential Mitigation Measure
Oil and Gas	Visibility Water Soil Flora Fauna	Decrease the number of wells active at one time Implement travelway mitigation listed above Use smaller drilling rigs Implement conformity regulations
Grazing	Visibility Water Soil Flora Fauna	Decrease the number of animals Maintain effective vegetation ground cover

^a Each mitigation measure described below applies to the protection of Air Quality Related Values for all *Forest Plan* alternatives. These and other mitigation measures will be applied on a project level basis. Project level analysis and monitoring will be conducted to assure compliance with the Clean Air Act.

